GMS-21

MAP SHOWING GEOLOGY AND GEOTHERMAL RESOURCES OF THE VALE EAST 7½' QUADRANGLE, OREGON 1982

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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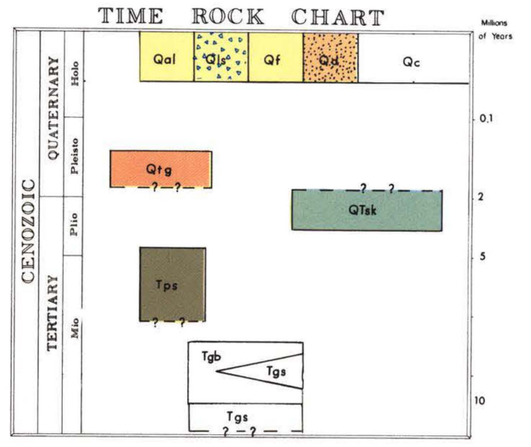
VALE EAST QUADRANGLE
OREGON—MALHEUR CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

GMS 21

TIME ROCK CHART



EXPLANATION

Surficial Geologic Units

Qal — **Recent alluvium and sedimentary deposits, undivided:** *Unconsolidated, generally unsorted, poorly to well-graded clay, silt, sand, and gravel in active stream channels, flood plains of Malheur River, and local ephemeral streams in East Cow Hollow, which is in southeast portion of quadrangle, and along Lytle Boulevard, which extends northwest-southeast through quadrangle. Partially equivalent to Qal (alluvium) of Privrasky (1953), Corcoran and others (1962), and Walker (1977)*

Qf — **Alluvial fan deposits:** *Unconsolidated to partially cemented, cross-bedded, poorly graded, poorly sorted mixtures of silt, sand, and gravel interfingering with unit* **Qal** *at mouths of canyons and gulleys; locally includes small erosional windows of underlying bed rock. Partially cemented with caliche ($CaCO_3$)*

Qd — **Dune sands and Recent eolian deposits:** *Transient deposits of unconsolidated eolian silts and sands. Generally forms longitudinal dunes, with occasional wind ripples. Located downwind from deflation basins developed in unit* **QTsk**

Qls — **Landslide deposits:** *Unconsolidated blocks of bed rock, silt, sand, and gravel having undergone large-scale downslope movement because of undercutting by Malheur River. Slide scarps on Rhinehart Butte include highly resistant, calcareous, silicified, brecciated high-angle fault zones. Slide masses locally recemented with calcite and quartz by active hydrothermal fluids*

Qc — **Colluvium and colluvium-blanketed bed rock:** *Unconsolidated, unsorted, ungraded, locally derived soil cover, pediment debris, and talus. Mapped as unit* **Qc** *where deposit completely obscures underlying bed rock. Shown as pattern over regular bedrock-unit color where deposits are thin enough that underlying unit may be inferred*

Qtg — **Pleistocene terrace gravels:** *Unconsolidated to partially cemented, poorly sorted, poorly graded gravel with minor amounts of silt and sand; composed of reworked Tertiary volcanic and minor Mesozoic metamorphic detritus. Forms isolated flat terraces adjacent to Malheur River flood plain. At least three terrace levels are identifiable west and south of mapped area. Partially equivalent to Qt (terraces) of Privrasky (1953) and Qtg (terrace gravels) of Corcoran and others (1962) and Walker (1977)*

Bedrock Geologic Units

QTsk — **Sedimentary rocks of Captain Keeney Pass** (middle Pliocene to Pleistocene): *Unconsolidated, friable, generally massive-bedded, poorly graded tuffaceous mudstones, siltstones, sandstones, volcanic conglomerates, and rare open-work conglomerates. Unit varies in color, ranging from very light gray (N8) to moderate yellowish brown (10 YR 5/4) in eastern portion of quadrangle to dark yellowish brown (10 YR 4/2) to dusky yellow green (5 GY 5/2) in western portion. Where unit is lithified, cement is generally limonitic or calcareous, with rare outcrops of silicified fine sandstone in areas of active hydrothermal systems. Calcareous cement predominates at base of unit near edge of sedimentary basin west and south of mapped area, where thinly laminated beds of limy oil shale and mudstone and oolitic, fossiliferous, freshwater limestone are common. Conglomerates are composed of subrounded volcanic detritus with some reworked clasts from silicified conglomerates of unit* **Tps**. *Unit* **QTsk** *forms low, rounded hills with poor outcrops. Best exposures are in Captain Keeney Pass and East Cow Hollow in southeast portion of quadrangle, where approximately 300 m of section are exposed in poor, discontinuous outcrops. Age of unit is bracketed as Blancan (Pliocene) to Pleistocene, based on regional geology and friable nature of rock. No diagnostic fossils were collected from this unit. Unit is partially equivalent to Ti (Idaho Formation) of Privrasky (1953) and Ts (tuffaceous sedimentary rocks and tuff) of Walker (1977). Unit is equivalent to upper part of Chalk Butte Formation (Tic) as mapped on regional basis by Corcoran and others (1962) but is stratigraphically above rocks of type section of Chalk Butte Formation and lithologically dissimilar to that unit. The term "Chalk Butte Formation" is therefore not used for this unit. Unit* **QTsk** *is unconformable over unit* **Tps**

Tps — **Pliocene sedimentary rocks:** *Well-lithified to friable, thin to massively bedded, poorly graded tuffaceous siltstones, sandstones, and conglomerates. Unit is moderate yellowish brown (10 YR 5/4) to moderate reddish brown (10 R 4/6), with darker color predominating in conglomerate facies. Where unit is lithified, cement is almost always limonite-stained silica with some very minor calcareous cement. Where exposed on Vale Butte, east-southeast of city of Vale, and to southwest, unit grades upward from friable tuffaceous siltstones to lithified, tuffaceous, fine- to medium-grained sandstones. Beds are overlain by series of highly silicified, foreset-bedded chert and volcanic pebble conglomerates, as at Vale and Rhinehart Buttes to southeast. Tuffaceous siltstone locally overlies conglomerate. Unit forms resistant cliffs 10-30 m high, with excellent exposures on antidip slopes. Thickness of unit in quadrangle, based on drill-hole data, is approximately 400 m. Age of bulk of unit* **Tps** *is probably Blancan, although base may be as old as upper Hemphillian. Rocks assigned to this unit are similar to those of type section of Chalk Butte Formation (Corcoran and others, 1962). However, further detailed mapping in surrounding quadrangles is necessary before definite correlations can be made. Drill-hole data from drill hole not shown on map but located between Vale Butte and Rhinehart Buttes indicate basaltic rocks from depth of 200 m to total well depth of 500 m. Thin sections of drill-hole chips examined for this project show distinct petrologic and stratigraphic similarity to Grassy Mountain Formation basalts of Hemphillian age (Storm, 1975), which crop out on Grassy Mountain and Double Mountain, southwest of quadrangle. Unit* **Tps** *is partially equivalent to Ti (Idaho Formation) of Privrasky (1953), Tic (Chalk Butte Formation member of the Idaho Group) and Td (Deer Butte Formation) as mapped by Corcoran and others (1962), and Ts (tuffaceous sedimentary rocks and tuff) of Walker (1977). It is unconformable beneath unit* **QTsk** *and overlies unit* **Tgb**

Tgb / Tgs — **Grassy Mountain Formation** (upper Miocene): *Dark-gray, amygdaloidal, porphyritic, olivine-bearing, clinopyroxene basalt (unit* **Tgb**), *interfingered with and underlain conformably by light-gray to brown siltstones, sandstones, and conglomerates (unit* **Tgs**). *Formation was encountered at depth of 200 m in drill hole between Rhinehart Buttes and Vale Butte and does not crop out in quadrangle. Nearest outcrops are out of mapped area, to the south between Chalk Butte and Mitchell Butte and to the southwest on flanks of Double Mountain and Grassy Mountain, where mapping by author and other investigators (Corcoran and others, 1962; Storm, 1975) indicates thicknesses of 300-400 m for basalts and intercalated sediments and 400-500 m for underlying sediments. Age for unit was determined to be Hemphillian, based on vertebrate fossils collected from interflow sediments, and possibly Clarendonian, based on fossils from sediments beneath basalt (Storm, 1975). Basalt (unit* **Tgb**) *and underlying sedimentary member (unit* **Tgs**) *of formation are shown in cross sections only. Corcoran and others (1962) assign name "Kern Basin Formation" to sediments underlying basalt and indicate Clarendonian age. Thus, sediments and basalts here described as Grassy Mountain Formation are Clarendonian and Hemphillian. Partially equivalent to Tig (Grassy Mountain basalt), Tigs (Grassy Mountain sediments), and Tik (Kern Basin Formation) of Corcoran and others (1962), Tgb (Grassy Mountain Formation) of Storm (1975), and Tob (olivine basalt) of Walker (1977)*

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SYMBOLS

Contact: Approximately located; queried where inferred

Fault: Approximately located, dashed where inferred, dotted where concealed. Ball and bar on downthrown side; bar shows dip; arrow shows bearing and plunge of grooves, striations, or slickensides; arrows indicate direction of relative motion

Attitude of Beds
Strike and dip
Horizontal

WELLS AND SPRINGS

Abandoned petroleum prospect well, with company name, well name, total depth (T.D.) in feet, and heat-flow data (see below)

Water well, with water temperature (°C)

Water well, with heat-flow data (see below)

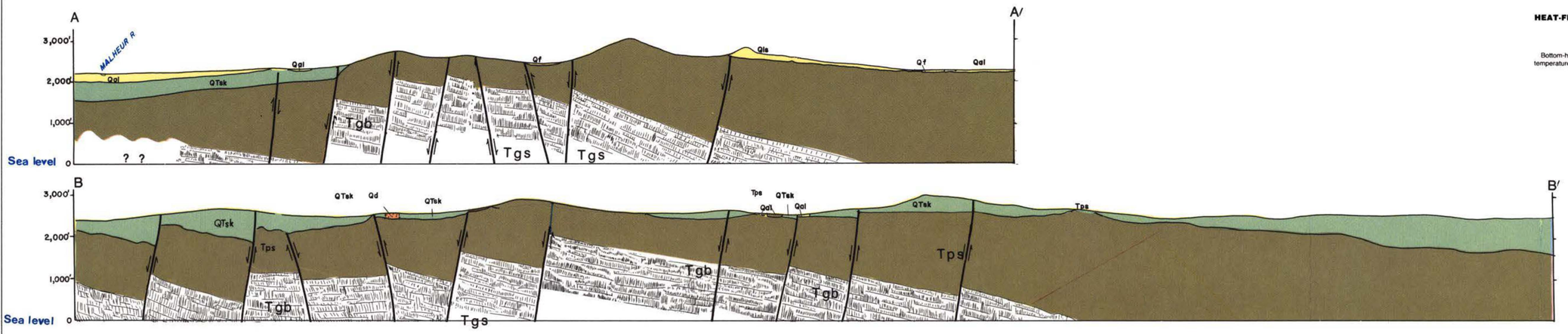
Flowing water well, with water temperature (°C)

Spring, with water temperature (°C)

HEAT-FLOW DATA

Gradient (°Ckm⁻¹)
Bottom-hole temperature (°C) — Probed depth (m)
Heat flow (mWm⁻²)

Geologic Cross Sections



Cartography by Chuck Schumacher

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1966–67. Field checked 1967

Polyconic projection. 1927 North American datum
10,000-foot grid based on Oregon coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue
To place on the predicted North American Datum 1983, move the projection lines 16 meters north and 79 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

UTM GRID AND 1967 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
U. S. Route

OREGON
QUADRANGLE LOCATION

VALE EAST, OREG.
N4352.5—W11707.5/7.5

1967

by **DAVID E. BROWN**

Based on work performed during 1980 and 1981. The author wishes to acknowledge the assistance of Mark D. Dellinger and John R. Petros during 1981.

Map photoinspected 1975
No major culture or drainage changes observed

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